

A detailed illustration of the Nancy Grace Roman Space Telescope in space. The telescope is a large, rectangular structure with a complex arrangement of solar panels, some of which are blue and others gold. It has a long, thin boom extending from one end, ending in a large, circular dish antenna. The background is a deep black space filled with stars, a bright sun or star in the upper right, and a view of the Earth's horizon. A prominent feature in the background is the Milky Way galaxy, showing its characteristic spiral arms and dust lanes. The overall scene conveys a sense of vastness and the advanced technology of space exploration.

# NANCY GRACE ROMAN SPACE TELESCOPE

## *Observatory Implementation and Challenges*

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# DR. NANCY GRACE ROMAN

- Astronomer
- Pioneer
- “Mother of Hubble”
- Queen of Plan B

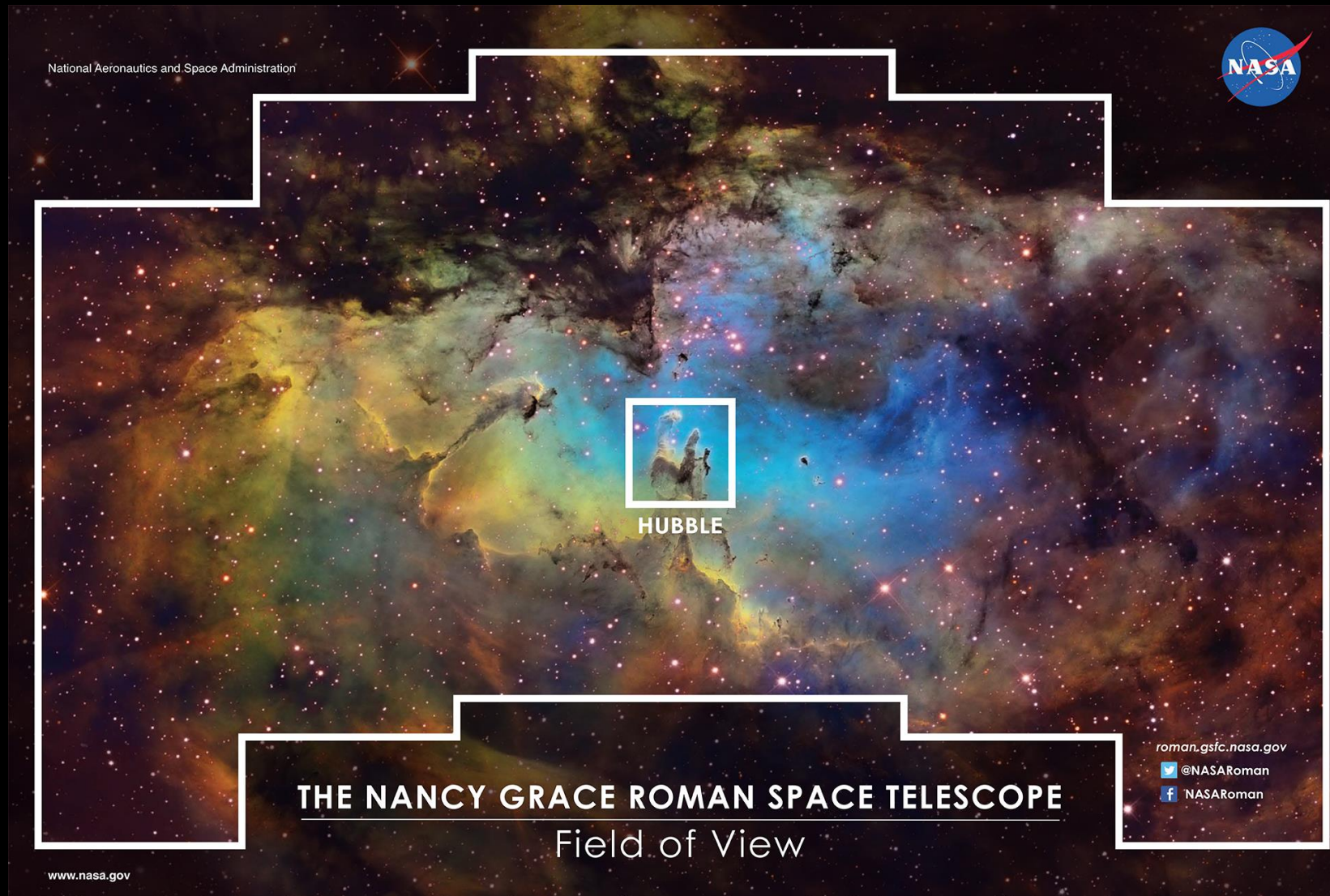
[https://en.wikipedia.org/wiki/Nancy\\_Roman](https://en.wikipedia.org/wiki/Nancy_Roman)





# SCIENCE

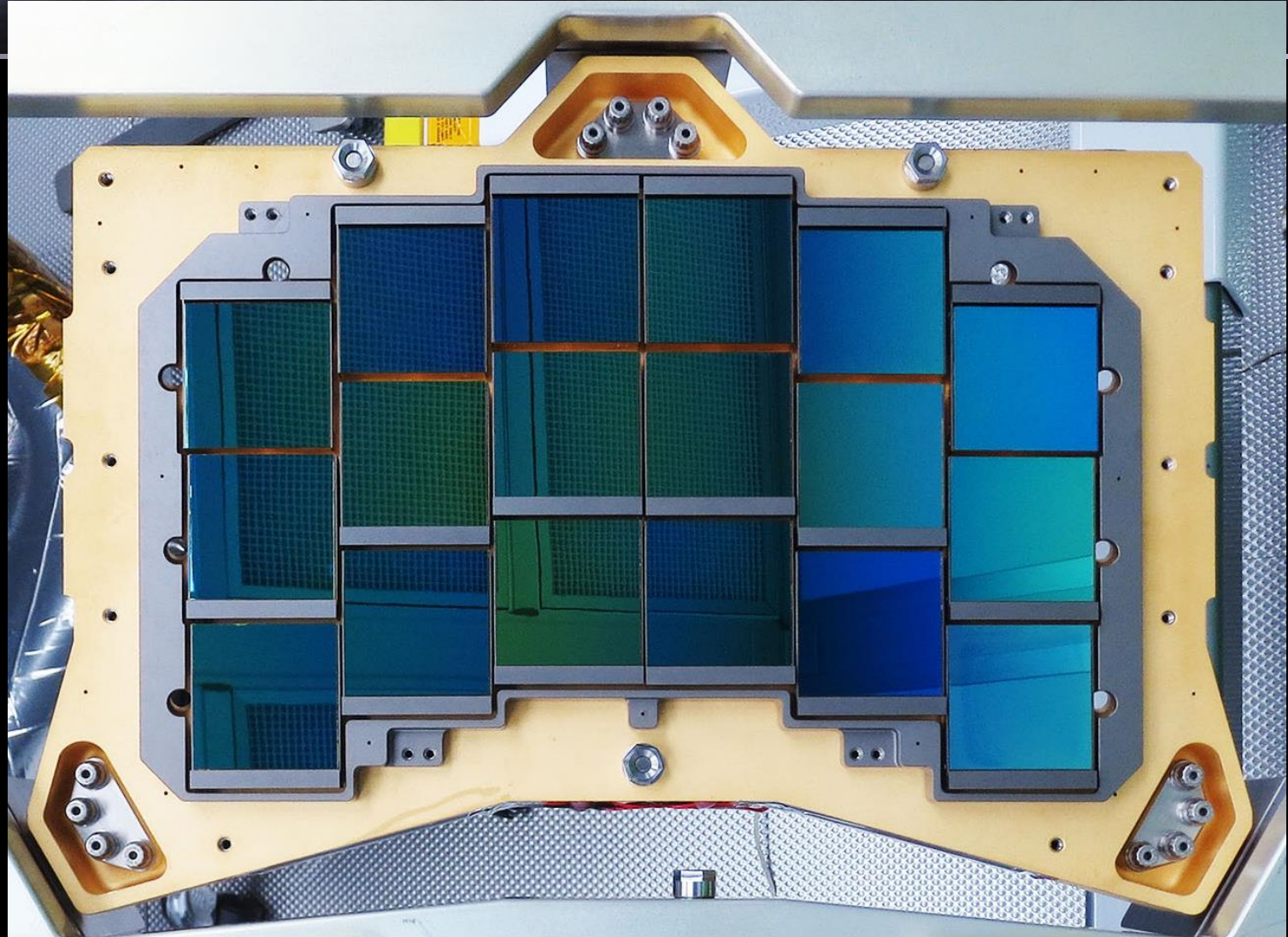
- Science objectives
  - Dark energy
  - Dark matter
  - Near-infrared astronomy
  - Exoplanet census
- Technology demo of exoplanet coronagraphy
- Guest investigator program





# MISSION

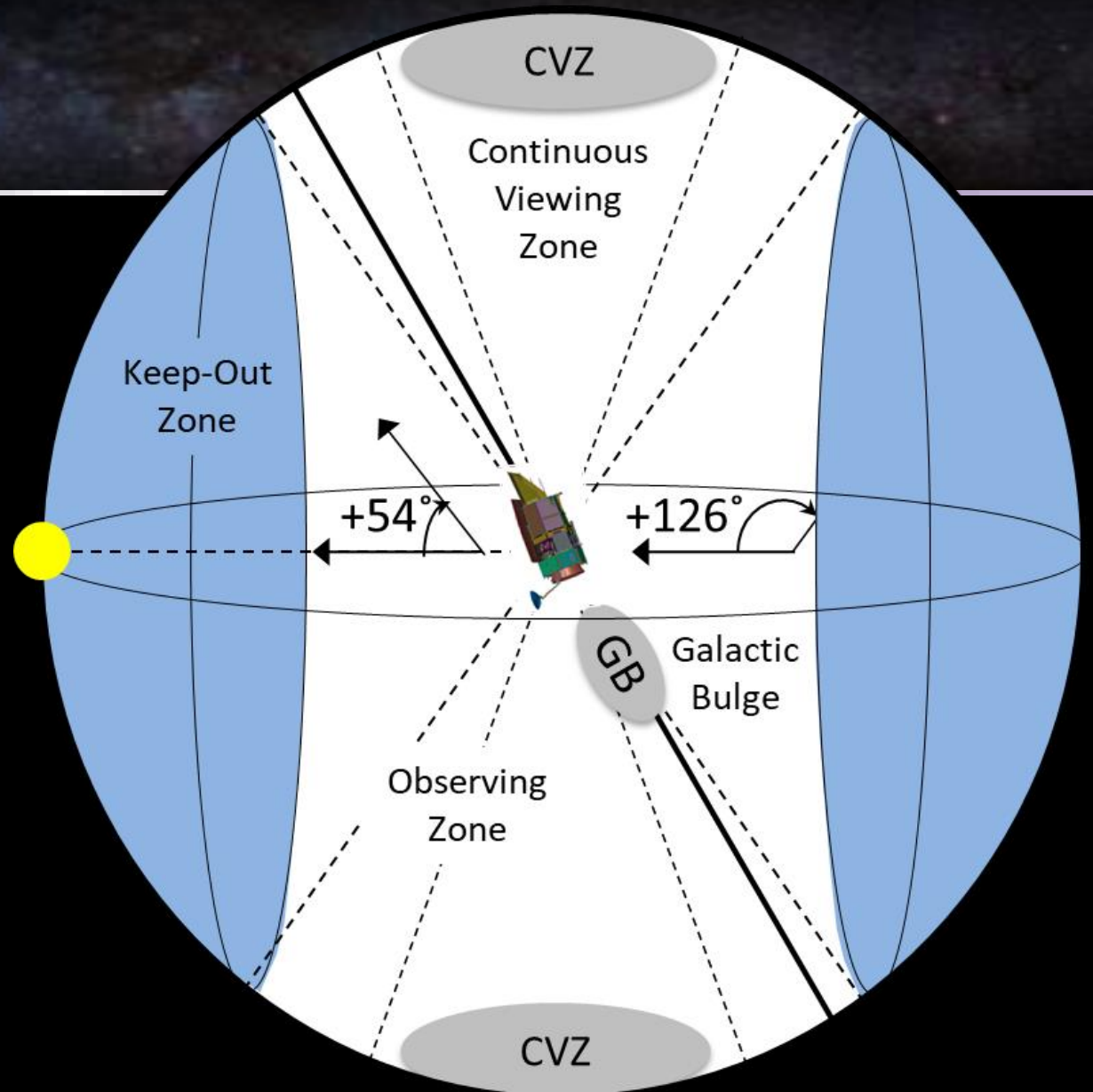
- Class A
- L2 orbit
- 5-year Mission life, 10-year goal
- 0.28 square degree instrument FOV
  - 18 4kx4k-pixel HgCdTe detector arrays
- Repurposed telescope components
- Survey mission



*Wide Field Instrument Mosaic Plate Assembly Development Unit*

# FIELD OF REGARD

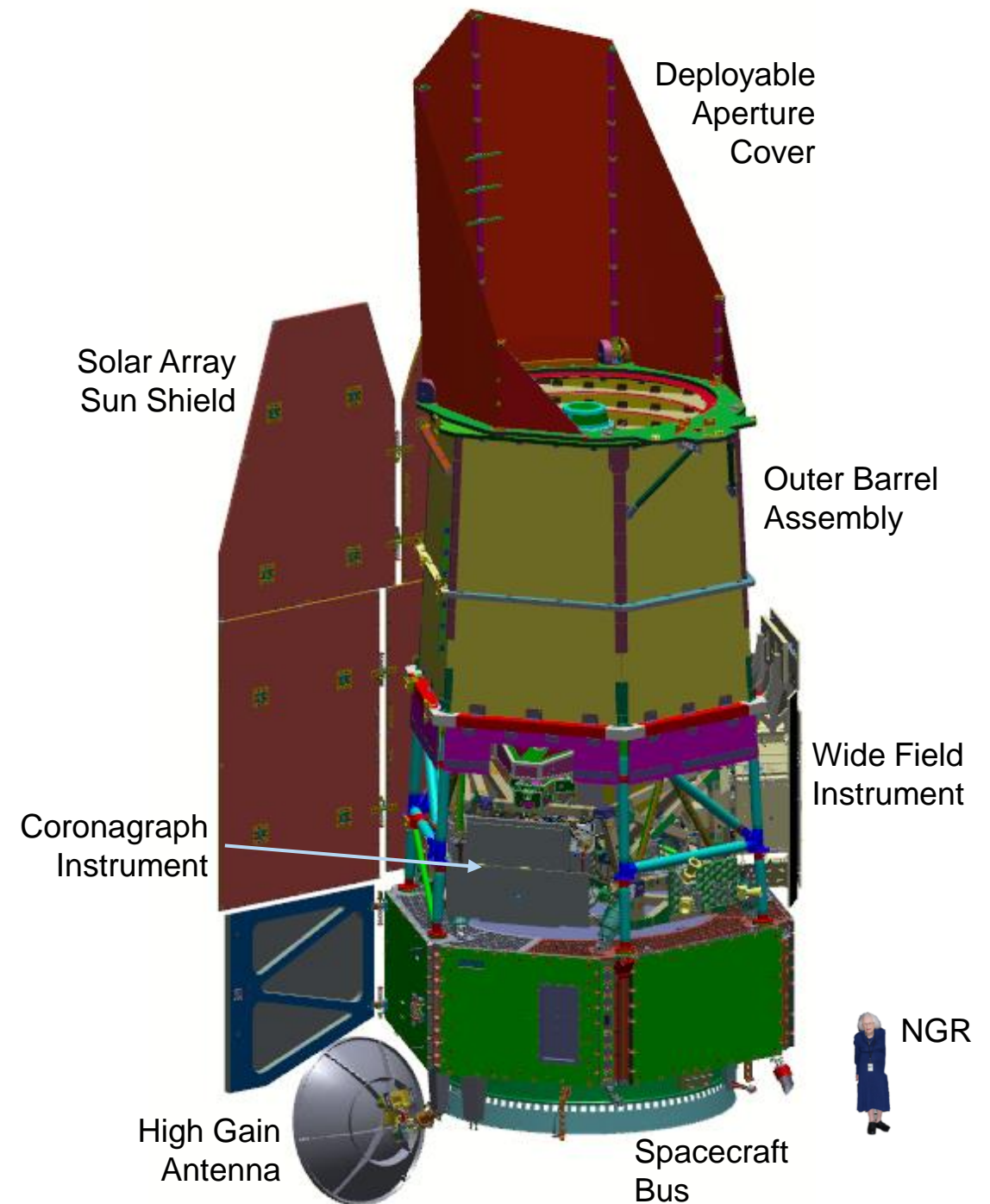
- Centered on ecliptic poles
  - 360° swath with keep-out zones toward sun and anti-sun
  - $\pm 15^\circ$  roll about the boresight
- ➡ Full sky coverage available over a year



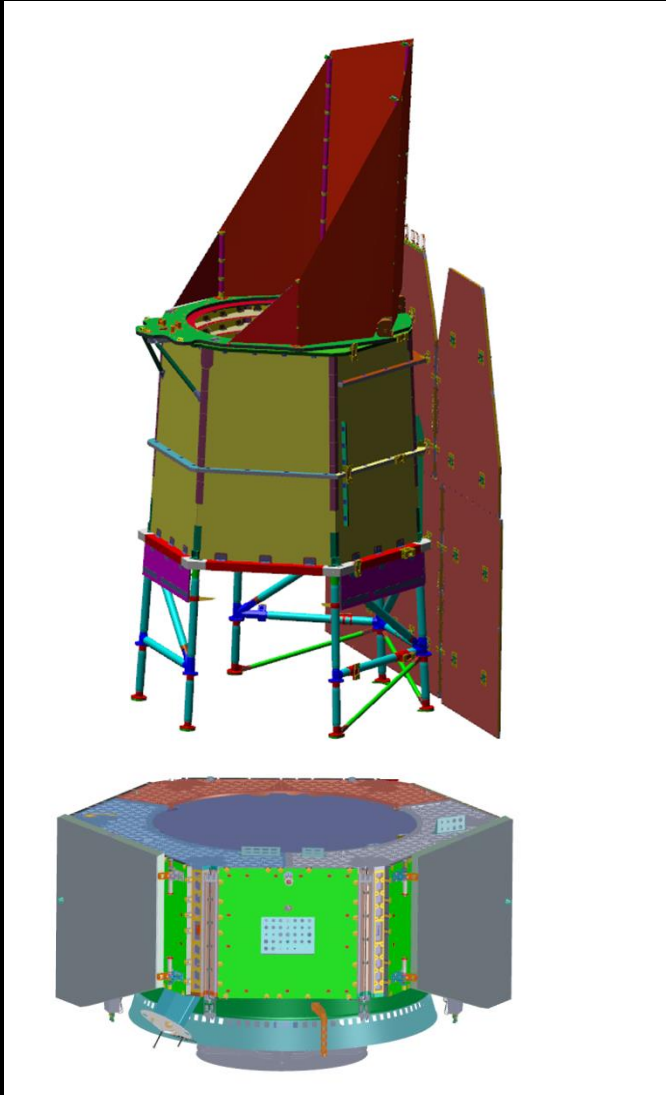


# OBSERVATORY

- ~12.7-m height, 10,500 kg, 4500W
- 3-axis stabilized, mono-prop hydrazine propulsion
- 1.7-m High Gain Antenna
- Vibration isolation between Payload and Spacecraft
- Tight thermal control



# OBSERVATORY

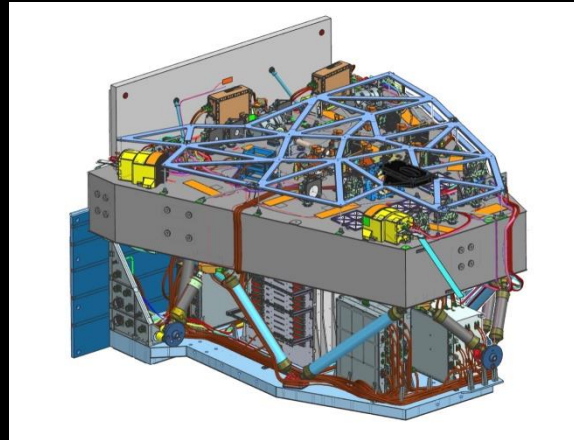
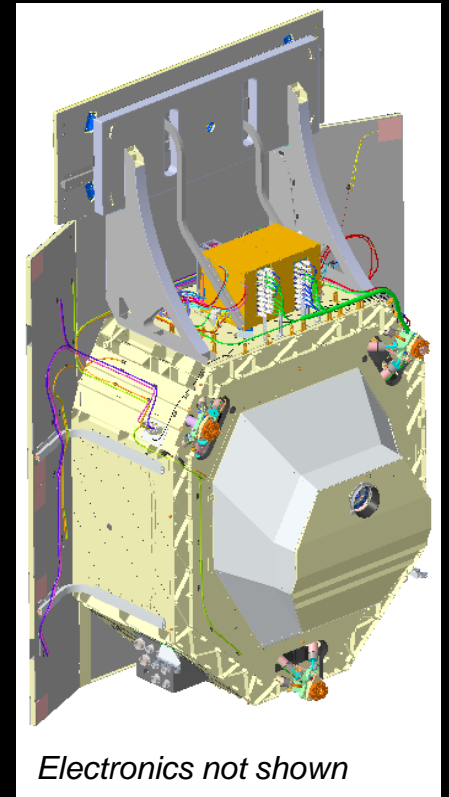


Spacecraft  
(NASA/GSFC)

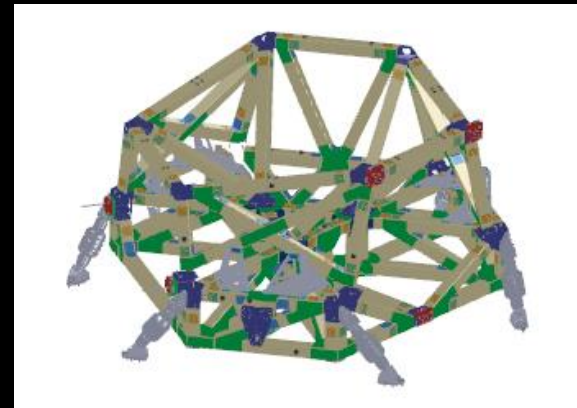
Optical  
Telescope  
Assembly  
(L3Harris)



Wide Field  
Instrument  
(NASA/GSFC +  
Ball Aerospace)

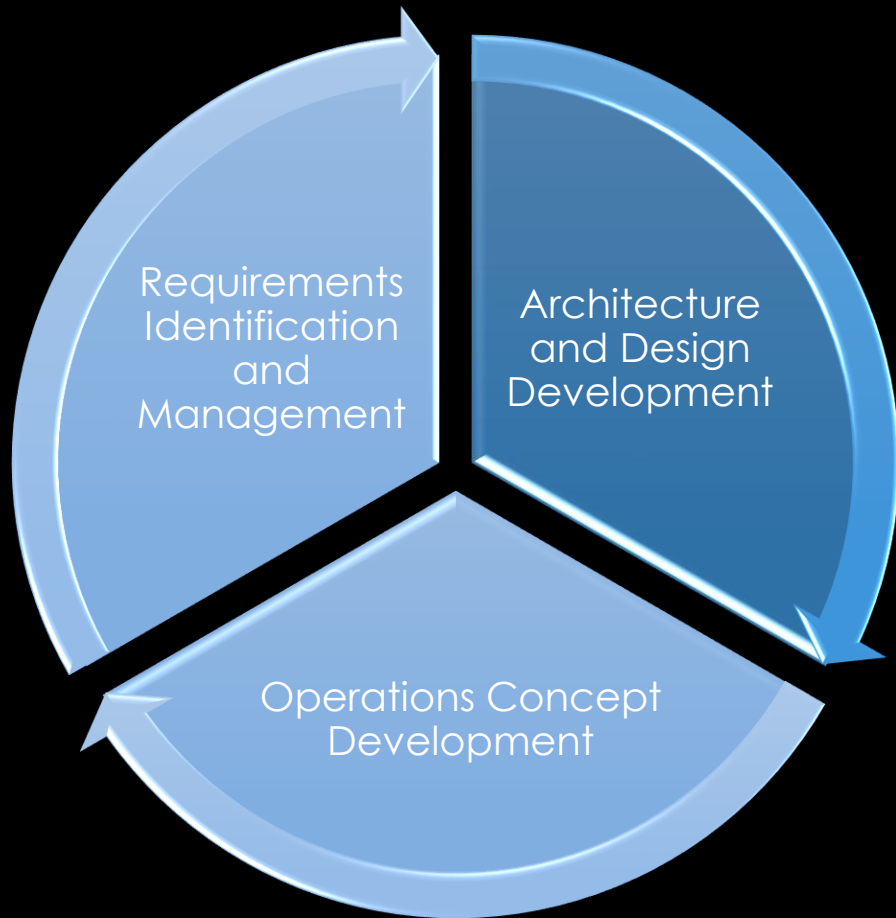


Coronagraph  
Instrument  
(JPL)



Instrument Carrier  
(NASA/GSFC +  
Northrop Grumman)

# SYSTEMS ENGINEERING TOOLS



## Implementation focus

- Architecture
  - Heritage
  - Trade Studies
- Operations Concept
  - Design Reference Mission

★ Communication and Collaboration



# SURVEY MISSION CHALLENGE

~630,000 exposures in 5 years

Observing  
efficiency

Stability

Event-driven  
operations

Fast slew and  
settle

Minimize  
disturbances

# SURVEY MISSION CHALLENGE

Level 2 Requirements:

LOS jitter - 12 mas  
Stability - 8 mas

CMG  
vs.  
RW

CMG  
Ø stability  
Ø jitter

CMG+RW  
Ø volume  
Ø power

RW

Trade Study

6-wheel pyramid

Slewing

Pointing  
stability

Momentum  
storage

Level 3  
Requirements

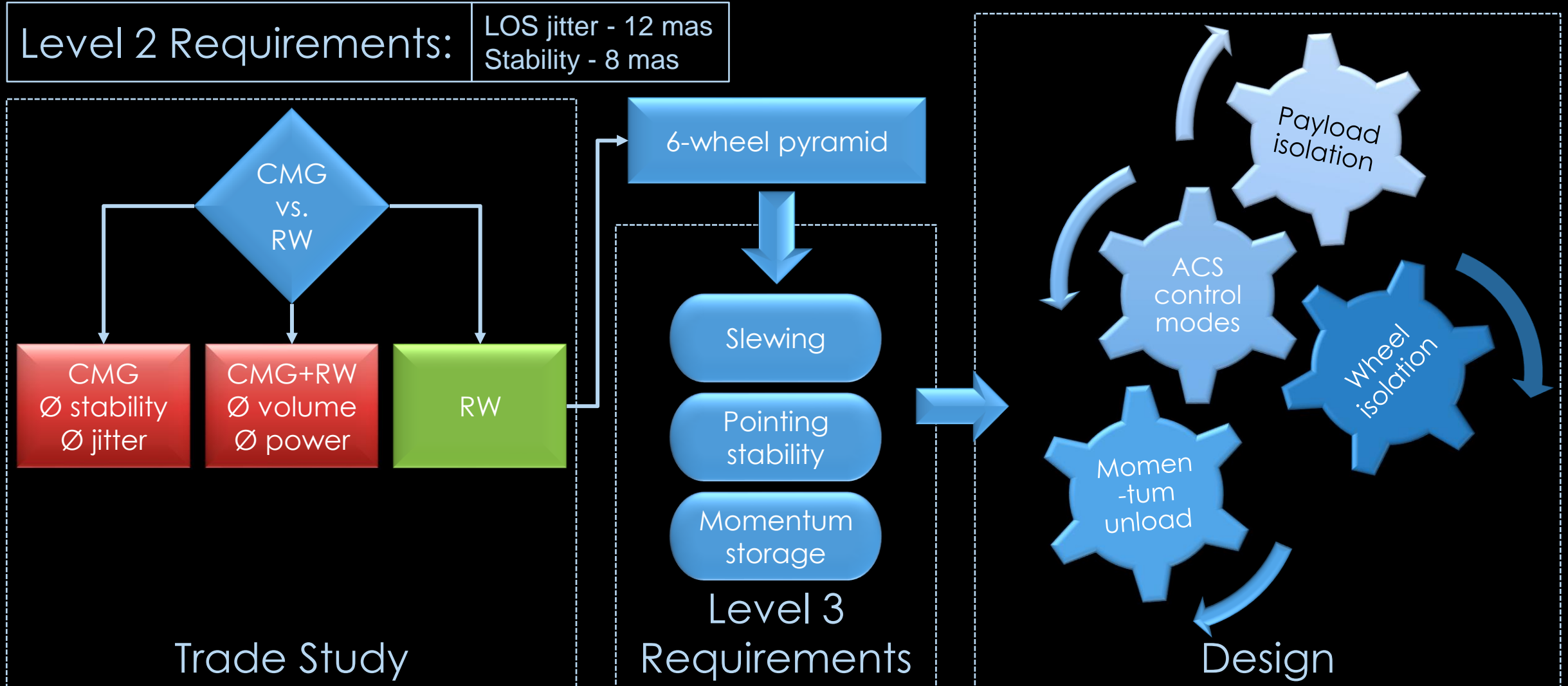
Payload  
isolation

ACS  
control  
modes

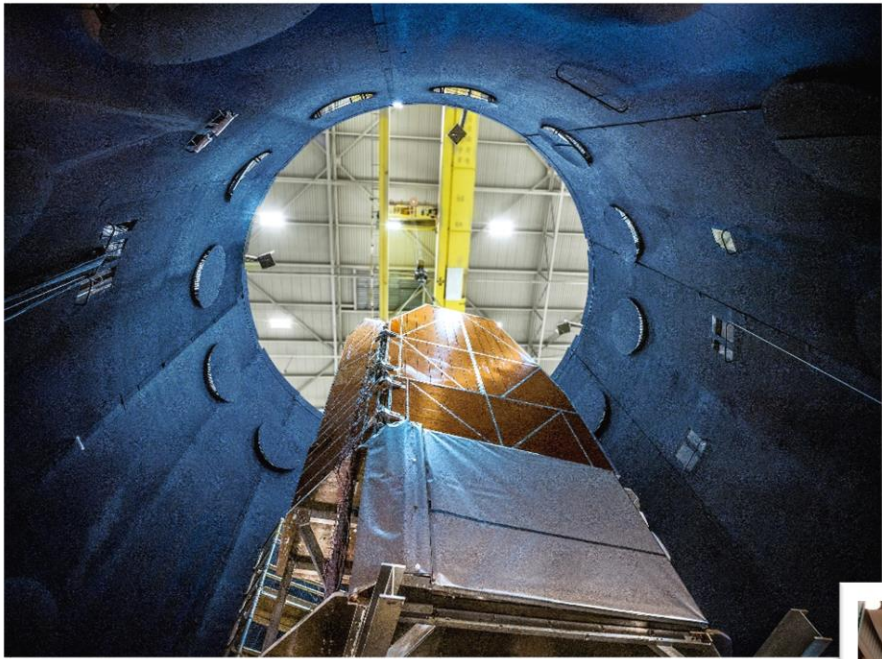
Wheel  
isolation

Momen-  
tum  
unload

Design





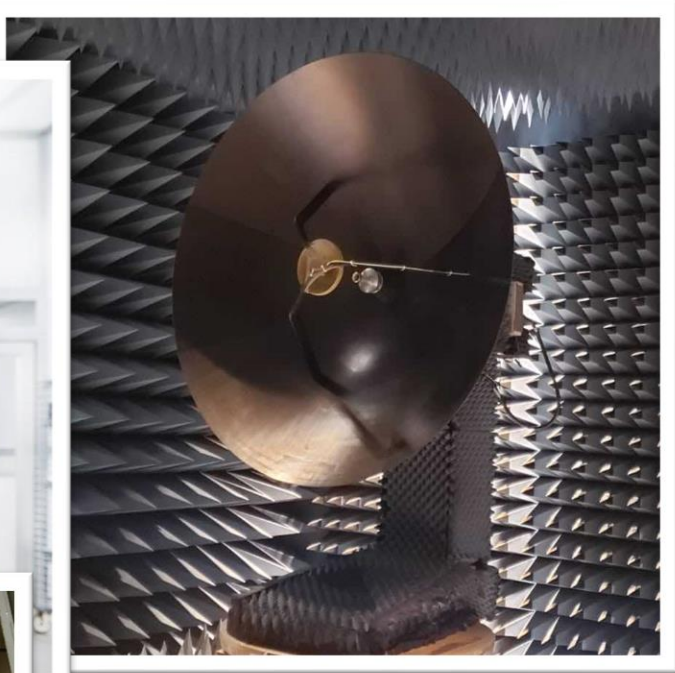


▲ SASS Engineering Unit in TVAC Chamber

▼ Roman detector array compared to a cell phone camera



▼ HGA Engineering Unit



▼ Stowed DAC Engineering Unit



▲ Flight Primary Mirror



▲ Telescope Forward Metering Structure and Primary Mirror Assembly





# CONTACT INFO

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Nancy Grace Roman  
Space Telescope



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<https://roman.gsfc.nasa.gov/index.html>